

CLAIMS:

1. A system for tracking a plurality of movable assets in a healthcare environment, the system comprising:
 - 5 a plurality of badges, each badge of the plurality of badges including a transmitter, the badge being adapted to be coupled to the asset, and the badge being configured to transmit an identification signal identifying the badge; and
 - a locating system configured to receive the identification signal from the respective badge and to determine a location of the asset in the healthcare environment including a height associated with the asset based at least in part on the identification signal, the locating system being further configured to determine if the height of the asset is an expected height.
2. The system of claim 1, wherein the expected height of the asset is assigned based on the type of asset.
- 15 3. The system of claim 1, wherein a first asset is a patient and the expected height of the patient corresponds to a height above a threshold height from the floor.
4. The system of claim 3, wherein the threshold height is at least three feet above the floor.
- 20 5. The system of claim 3, wherein the locating system is further configured to perform at least one of the following if the first asset is at an unexpected height, send an indication to a caregiver and initiate an alarm.
6. The system of claim 5, wherein the locating system is configured to wait a predetermined time period to determine if the first asset has moved to an expected height before performing at least one of the following, send an indication to a caregiver and initiate an alarm.
- 25 7. The system of claim 3, wherein the locating system is further configured to receive equipment status information from a sensor associated with a first piece of equipment positioned in the healthcare environment.
- 30 8. The system of claim 7, wherein the locating system determines if the first asset is at an unexpected height based on the location of the first asset and a status of the first piece of equipment.

9. The system of claim 8, wherein the first piece of equipment is a bed and the sensor provides status information of the position of the siderail.

10. The system of claim 9, wherein the locating system determines that the first asset is at an unexpected height if the first asset is at a height below the
5 threshold height and the sensor indicates that the siderail is in a down position.

11. The system of claim 8, wherein the first piece of equipment is a bed and the sensor provides status information on the configuration of the bed.

12. The system of claim 11, wherein the locating system determines that the first asset is at an expected height if the first asset is at a height
10 below the threshold height and the sensor indicates that the bed is in a low configuration.

13. The system of claim 1, wherein the locating system includes means for receiving the identification signal from each badge and means for determining the location of the corresponding asset.

14. The system of claim 3, wherein the badge associated with the first asset includes a displacement sensor and wherein the location system is further configured to use acceleration information provided by the displacement sensor to determine if the first asset is at an unexpected height.

15. The system of claim 1, wherein a second asset is a piece of equipment and the expected height of the piece of equipment corresponds to a height
20 above a threshold height from the floor.

16. The system of claim 15, wherein the threshold height is at least three feet above the floor.

17. The system of claim 1, wherein a second asset is a piece of equipment and the expected height of the piece of equipment corresponds to a range
25 of heights.

18. The system of claim 15, wherein the locating system is further configured to indicate that the second asset needs to be recertified in response to a determination that the second asset is at an unexpected height.

19. The system of claim 18, wherein the locating system is configured to wait a predetermined time period to determine if the second asset has moved to an expected height before indicating that the second asset needs to be
30

recertified.

20. The system of claim 15, wherein the badge associated with the second asset includes a displacement sensor and wherein the location system is further configured to use acceleration information provided by the displacement sensor to
5 determine if the second asset needs to be recertified.

21. The system of claim 1, wherein the locating system prevents the movement of a first asset based on the location of at least a second asset.

22. The system of claim 1, wherein the locating system includes a plurality of receivers positioned throughout the healthcare environment, each of the
10 receivers configured to receive an identification signal from a badge positioned within range of the receiver, and a processor configured to receive from the plurality of receivers the identification of the badges detected by each receiver, the processor being configured to determine the location of each asset based on the locations of the receivers which detected the badge associated with the asset.

23. A method for monitoring an asset to determine if the asset has been dropped or has fallen, the method comprising the steps of:

providing a badge adapted to be coupled to the asset, the badge having an accelerometer configured to monitor a vertical acceleration of the asset and a transmitter;

20 monitoring the vertical component of the acceleration of the badge; transmitting information regarding the vertical acceleration of the badge;

determining if the vertical acceleration of the badge has exceeded a threshold value;

25 identifying the asset as having been dropped or as having fallen based on the vertical acceleration exceeding the threshold value.

24. The method of claim 23, wherein the step of determining if the vertical acceleration of the badge has exceeded a threshold value is performed by a processor remote from the badge.

30 25. The method of claim 23, wherein the step of determining if the vertical acceleration of the badge has exceeded a threshold value is performed by a processor of the badge.

26. The method of claim 23, wherein the vertical acceleration component is used to determine a speed associated with the asset.

27. The method of claim 23, further comprising the step of initiating an alarm based on a determination that the asset has fallen or has been
5 dropped.

28. The method of claim 23, further comprising the step of providing an indication to a caregiver associated with the asset that the asset has fallen or has been dropped.

29. The method of claim 23, further comprising the step of flagging
10 the asset as requiring recertification based on a determination that the asset has fallen or been dropped.

30. A system for tracking a plurality of movable assets in a healthcare facility, the system comprising:

a plurality of badges, each badge of the plurality of badges including a
15 transmitter, the badge being adapted to be coupled to the asset, and the badge being configured to transmit an identification signal identifying the badge, a first badge being associated with a first movable asset;

a locating system configured to receive the identification signal from the first badge and to determine a location of the first movable asset in the healthcare
20 facility based at least in part on the identification signal received from the first badge; and

at least one portable device, the portable device including a controller, a display, a memory, an input device, and a transceiver, the portable device being configured to generate a request signal to be received by the locating system
25 requesting the location of the first movable asset in the healthcare facility, to receive a location signal from the locating system indicating the location of the first movable asset and to provide appropriate directions to a first location in the healthcare facility based on the location of the first movable asset.

31. The system of claim 30, wherein the first location corresponds
30 to the location of the first movable asset.

32. The system of claim 30, wherein the first location corresponds to a location different than the identified location of the first movable asset.

33. The system of claim 30, wherein a user is associated with the portable device and the portable device is configured to provide appropriate directions based on the locations within the healthcare facility the user of the portable device which the user has access to.

5 34. The system of claim 33, wherein the first location corresponds to a location within the facility different than the location of the first movable asset when the first movable asset is in a location within the facility which the user of the portable device does not have access.

10 35. The system of claim 34, wherein the first movable asset is a patient whose current location is in surgery and the first location is a waiting room associated with the surgery location of the patient.

 36. The system of claim 34, wherein the first movable asset is a piece of equipment whose current location is in an equipment room and the first location corresponds to the location of a clerk associated with the equipment room.

15 37. The system of claim 34, wherein the portable device is configured to allow the user to add the first asset to a watch list and to notify the user when the first asset is in a location which the user has access.

 38. The system of claim 30, wherein the appropriate directions are visual directions and are displayed on the display, the visual directions includes a map of the facility including the location of the portable device, the location of the requested first movable asset, and a suggested route to the asset.

 39. The system of claim 38 wherein the suggested route corresponds to one of the shortest distance route to the first movable asset and the shortest time route to the first movable asset.

25 40. The system of claim 39, wherein the shortest time route is determined based at least in part on potential congestion in various locations along at least two routes.

 41. The system of claim 40, wherein the potential congestion in various locations along at least two routes is determined by an activity monitoring system.

30 42. The system of claim 41, wherein the activity monitoring system accumulates the data from the plurality of badges, associates portions of the data with

particular activities, and generates statistical analyses of the data associated with the particular activities to identify characteristics associated with the particular activities.

43. The system of claim 30, wherein the map is a three dimensional map.

5 44. The system of claim 43, wherein the map includes representations of various assets based on their current locations.

45. The system of claim 30, wherein the appropriate instructions are visual instructions, the visual instructions including a direction-indicating symbol.

10 46. The system of claim 30, wherein the first portable device includes a speaker and the appropriate directions are audio directions.

47. The system of claim 30, wherein the user requests a second asset with the input device and the locating system determines the location of the second asset and issues a command for the second asset to be taken to a second location.

15 48. The system of claim 47, wherein the second location is the current location of the user of the portable device.

49. The system of claim 47, wherein the second location is a location specified by the user of the portable device.

20 50. The system of claim 47, wherein the locating system determines if the asset is available based on information supplied by an activity monitoring system.

51. The system of claim 47, wherein an orderly is notified of the request for the asset by the locating system.

25 52. The system of claim 30, wherein the user of the portable device is presented with a virtual facility including representations of various assets each having a badge associated therewith, the representations being positioned within the virtual facility based on the location information for each asset.

30 53. The system of claim 52, wherein a third asset has multiple representations, each representation selected for inclusion in the virtual facility based on a status of the third asset.

54. The system of claim 53, wherein the third asset is a bed having a first representation corresponding to a bed having a raised head section.

55. The system of claim 52, wherein a representation of a fourth asset is animated to simulate movement or use of the asset.

56. The system of claim 55, wherein the fourth asset is an I/V pump and the animation represents that the pump is receiving power and is pumping.

5 57. The system of claim 52, wherein the user can select an asset within the virtual facility to retrieve information related to the asset.

58. The system of claim 57, wherein the information is selected from the group of maintenance records, specifications, status, and prior locations.

10 59. The system of claim 57, wherein the information is related to an alarm status associated with the asset.

60. The system of claim 57, wherein the user can remotely change the status of the asset.

61. The system of claim 57, wherein the user can remotely change the configuration of the asset.

15 62. The system of claim 52, wherein the various assets are color-coded based on a status of the respective asset.

63. The system of claim 62, wherein a fifth asset is a caregiver and the caregiver is color-coded to indicate a contaminated status.

20 64. The system of claim 63, wherein the fifth asset is the user of the portable device.

65. A system for tracking a plurality of movable assets in a healthcare facility, the system comprising:

25 a plurality of badges, each badge of the plurality of badges including a transmitter, the badge being adapted to be coupled to the asset, and the badge being configured to transmit an identification signal identifying the badge, a first badge being associated with a first movable asset;

30 a locating system configured to receive the identification signal from the first badge and to determine a location of the first movable asset in the healthcare facility based at least in part on the identification signal received from the first badge; and

a virtual facility interface including a display and an input device, wherein the virtual facility interface presents a virtual facility including a map of the

facility and representations of various assets each having a badge associated therewith, the representations being positioned within the virtual facility based on the location information determined by the locating system for each asset, at least the first asset including multiple representations including a first representation corresponding to a first status and a second representation corresponding to a second status.

66. The system of claim 65, wherein the virtual facility interface is a portable device carried by a caregiver.

67. The system of claim 65, wherein the virtual facility interface is a virtual reality system wherein the user is presented a three-dimensional representation of the facility.

68. The system of claim 65, wherein the first representation of the first asset is selected for inclusion in the virtual facility based on the first asset having the first status, the status of the first asset being determined by an activity monitoring system.

69. The system of claim 65, wherein the first asset is a bed and the first representation corresponds to a bed having a raised head section.

70. The system of claim 65, wherein a representation of a second asset is animated to simulate movement or use of the asset.

71. The system of claim 70, wherein the second asset is an I/V pump and the animation represents that the pump is receiving power and is pumping.

72. The system of claim 65, wherein the user can select an asset within the virtual facility to retrieve information related to the asset.

73. The system of claim 72, wherein the information is selected from the group of maintenance records, specifications, status, and prior locations.

74. The system of claim 72, wherein the information is related to an alarm status associated with the asset.

75. The system of claim 65, wherein the user can remotely change the status of the asset.

76. The system of claim 65, wherein the user can remotely change the configuration of the asset.

77. The system of claim 65, wherein at least one of the various assets are color-coded based on a status of the respective asset.

78. The system of claim 77, wherein a third asset is a caregiver and the caregiver is color-coded to indicate a contaminated status.

79. The system of claim 78, wherein the virtual facility interface is a portable device carried by a first caregiver and the third asset is the first caregiver
5 associated with the portable device.

80. A system for tracking a plurality of movable assets in a healthcare environment, the system comprising:

a plurality of badges, each badge of the plurality of badges including a transmitter and a displacement sensor, the badge being adapted to be coupled to the
10 asset; and

a locating system including a plurality of transmitters positioned at fixed locations within the healthcare environment and a processor with an associated receiver, the processor configured to receive an identification signal from the respective badges and the plurality of transmitters configured to transmit
15 identification signals identifying the transmitter, wherein a first badge is configured to receive the transmitter identifying signals from the transmitters within range of the first badge, to transmit an identification signal to the processor of the locating system, the identification signal including identification information identifying the first badge and motion information collected by the first badge based on the displacement
20 sensor, and wherein one of the processor and the first badge determines the location of the first badge based on the transmitter identifying signals received by the first badge.

81. The system of claim 80, wherein the first badge determines the location of the first badge in the healthcare environment based on the transmitter
25 identifying signals received by the first badge.

82. The system of claim 81, wherein the first badge determines the location of the first badge based in part on the signal strength of the transmitter identifying signals received by the first badge.

83. The system of claim 81, wherein the transmitter identifying
30 signals each includes a timestamp identifying when the transmitter identifying signal was sent and wherein the first badge determines the location of the first badge based in part on the timestamp of the transmitter identifying signals received by the first

badge.

84. The system of claim 80, wherein the processor determines the location of the first badge in the healthcare environment based on the transmitter identifying signals received by the first badge.

5 85. The system of claim 84, wherein the processor determines the location of the first badge based in part on the signal strength of the transmitter identifying signals received by the first badge.

86. The system of claim 84, wherein the transmitter identifying signals each includes a timestamp identifying when the transmitter identifying signal was sent and wherein the processor determines the location of the first badge based in
10 part on the timestamp of the transmitter identifying signals received by the first badge.

87. The system of claim 80, wherein the displacement sensor generates signals indicating movement of the asset coupled to the badge and a direction of the movement.

15 88. The system of claim 80, wherein the displacement sensor provides a vertical acceleration measurement which is used by one of the first badge and the processor to determine if the corresponding asset has fallen or has been dropped.